## AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

## LISTING OF CLAIMS:

1. (Currently Amended) A device for thermal overload protection of an electrical device, particularly an electric motor (M), the device comprising means ~~(10)~~ for measuring at least one load current supplied to the electrical device (M), means ~~(16)~~ for calculating the thermal load on the electrical device on the basis of said at least one load current, and means (S2) for interrupting a current supply (L1, L2, L3) when the thermal load reaches a given threshold level, ~~characterized in that~~ wherein the device comprises a processor system employing X-bit, preferably X=32, fixed-point arithmetic, the system comprising means for scaling the current measured into unit values to a range of 0 to Y, wherein Y represents Y/100% of a nominal current, and means for calculating a time-to-trip in accordance with formula

$$\tau = R^*C^* \ln (a)$$

$$a = 1 - \left( \frac{\Theta_{trip} - \Theta}{i^2 - \Theta} \right)$$

wherein

$\Theta_{trip}$ = trip level for thermal load

$\Theta$ = calculated thermal load

$\tau$ = estimated time to moment when $\Theta$ reaches trip level $\Theta_{trip}$

$\Delta T$ = interval for thermal load calculation

R = cooling factor of electrical device

C = trip-class factor

i = measured current

whereby the equation and its operands are programmed into the

microprocessor system structured such that a result or a provisional result never exceeds the X-bit value.

2. (Currently Amended) A device as claimed in claim 1, ~~characterized in that~~ wherein one or more following operand values are used $\Theta$ = 0 to 200% preferably corresponding to a value range of 0 to 2.4 $\Delta T$ = interval for thermal load calculation in milliseconds R = cooling factor of electrical device in a range of 1 to 10.

3. (Currently Amended) A device as claimed in claim 1, ~~or 2,~~ ~~characterized in that~~ wherein the mathematical equation that, together with its operands, is structured such that the result or the provisional result of the calculation of the thermal load never exceeds the 32-bit value is

a=1*e10_SCALING-($\Theta_{trip}$ -$\Theta$)*e10_SCALING/(i2/PUCOMP-$\Theta$))

$\tau$=(R*C*(log(a)*SCALING-(LN_e10*SCALING)))/-SCALING

wherein

e10_SCALING is scaling factor for function $e^{10}$

LN_e10 represents function $\ln(e^{10})$

i = measured current scaled into unit value

SCALING is accuracy scaling whose value depends on the required accuracy.

PUCOMP is per-unit compensation.

4. (Currently Amended) A device as claimed in claim 3, ~~characterized in that~~ wherein one or more following operand values are used

e10_SCALING = 22026

LN_e10 = 10

i = measured current scaled into unit value to range 0 to 65000 corresponding to 0 to 650% of the nominal current,

SCALING = 10000

PUCOMP = 10000.

5. (Currently Amended) A device as claimed in ~~any one of claims 1 to 4, characterized in that~~ claim 1, wherein the device comprises a memory wherein a look-up table is stored including values of function ln(a) for a set of values of parameter a, and that said calculation means are arranged to retrieve a value corresponding to parameter a from the look-up table during the calculation of the equation.

6. (Currently Amended) A device as claimed in claim 1, ~~2, 3 or 4, characterized in that~~ wherein C is trip-class factor $t_6$ multiplied by a constant, preferably 29.5, or calculated by the formula (1/k) * Te * $(Ia/In)^2$, wherein Ia = starting current, In = nominal current, Te = allowed starting time and k = constant, preferably k = 1.22.

7. (Currently Amended) A method for thermal overload protection of an electrical device, particularly an electric motor, the method comprising measuring at least one load current supplied to the electrical device, calculating the thermal load on the electrical device on the basis of said at least one load current, ~~and~~ interrupting current supply to the electrical device when the thermal load reaches a given threshold level, ~~characterized by~~ scaling the measured current into a unit value to a range of 0 to Y, wherein Y represents Y/100% of a nominal current, and calculating the time-to-trip using an X-bit, preferably X=32, processor system employing fixed-point arithmetic, by solving the following equation structured and scaled such that a result or a provisional result never exceeds the X-bit value:

$$\tau = R * C * \ln(a)$$

$$a = 1 - \left( \frac{\Theta_{trip} - \Theta}{i^2 - \Theta} \right)$$

wherein

$\Theta_{trip}$ = trip level for thermal load

$\Theta$ = calculated thermal load

$\tau$ = estimated time to moment when $\Theta$ reaches trip level $\Theta_{trip}$

$\Delta T$ = interval for thermal load calculation

R = cooling factor of electrical device

C = trip-class factor

i = measured current

whereby the equation and its operands are structured such that a result or a provisional result never exceeds the X-bit value.

8. (Currently Amended) A method as claimed in claim 7, ~~characterized by~~ comprising: using one or more of the following operand values

Θ = calculated thermal load 0 to 200% preferably corresponding to a value range of 0 to 2.4

ΔT = interval for thermal load calculation in milliseconds

R = cooling factor of electrical device in a range of 1 to 10.

9. (Currently Amended) A method as claimed in claim 7, ~~or 8,~~ ~~characterized by~~ wherein the mathematical equation that, together with its operands, is structured such that the result or the provisional result of the calculation of the thermal load never exceeds the 32-bit value being

$a=1*e10\_SCALING-(\Theta_{trip}-\Theta)*e10\_SCALING/(i2/PUCOMP-\Theta))$

$\tau=(R*C*(\log(a)*SCALING-(LN\_e10*SCALING)))/-SCALING$

wherein

e10_SCALING is scaling factor for function $e^{10}$

LN_e10 represents function $\ln(e^{10})$

i = measured current scaled into unit value

SCALING is accuracy scaling whose value depends on the required accuracy.

PUCOMP is per-unit compensation.

10. (Currently Amended) A method as claimed in claim 9, ~~characterized by~~ comprising: using one or more of the following operand values

e10_SCALING = 22026

LN_e10 = 10

i = measured current scaled into unit value to range 0 to 65000 corresponding to 0 to 650% of the nominal current,

SCALING = 10000

PUCOMP = 10000.

11. (Currently Amended) A method as claimed in ~~any one of claims 7 to 10, characterized by~~ claim 7, comprising:

storing a look-up table including values of function ln(a) for a set of values of parameter a, and

retrieving a value corresponding to parameter a from the look-up table during the calculation.

12. (Currently Amended) A method as claimed in claim 7, ~~8, 9 or 10, characterized by~~ wherein C being trip-class factor $t_6$ multiplied by a constant, preferably 29.5, or calculated by the formula (1/k) * Te * $(Ia/In)^2$, wherein Ia = starting current, In = nominal current, Te = allowed starting time and k = constant, preferably k = 1.22.

13. (New) A device as claimed in claim 2, wherein the mathematical equation that, together with its operands, is structured such that the result or the provisional result of the calculation of the thermal load never exceeds the 32-bit value is

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a=1*e10_SCALING-(Θtrip -Θ)*e10_SCALING/(i2/PUCOMP-Θ))
τ=(R*C*(log(a)*SCALING-(LN_e10*SCALING)))/-SCALING
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wherein

e10_SCALING is scaling factor for function $e^{10}$

LN_e10 represents function $\ln(e^{10})$

i = measured current scaled into unit value

SCALING is accuracy scaling whose value depends on the required accuracy.

PUCOMP is per-unit compensation.

14. (New) A device as claimed in claim 4, wherein the device comprises a memory wherein a look-up table is stored including values of function ln(a) for a set of values of parameter a, and that said calculation means are arranged to retrieve a value corresponding to parameter a from the look-up table during the calculation of the equation.

15. (New) A device as claimed in claim 13, wherein the device comprises a memory wherein a look-up table is stored including values of function ln(a) for a set of values of parameter a, and that said calculation means are arranged to retrieve a value corresponding to parameter a from the look-up table during the calculation of the equation.

16. (New) A device as claimed in claim 4, wherein C is trip-class factor $t_6$ multiplied by a constant, preferably 29.5, or calculated by the formula (1/k) * Te * $(Ia/In)^2$, wherein Ia = starting current, In = nominal current, Te = allowed starting time and k = constant, preferably k = 1.22.

17. (New) A device as claimed in claim 15, wherein C is trip-class factor $t_6$ multiplied by a constant, preferably 29.5, or calculated by the formula (1/k) * Te * $(Ia/In)^2$, wherein Ia = starting current, In = nominal current, Te = allowed starting time and k = constant, preferably k = 1.22.

18. (New) A method as claimed in claim 8, wherein the mathematical equation that, together with its operands, is structured such that the result or the provisional result of the calculation of the thermal load never exceeds the 32-bit value being

a=1*e10_SCALING-($\Theta_{trip}$ -$\Theta$)*e10_SCALING/(i2/PUCOMP-$\Theta$))

$\tau$=(R*C*(log(a)*SCALING-(LN_e10*SCALING)))/-SCALING

wherein

e10_SCALING is scaling factor for function $e^{10}$

LN_e10 represents function $\ln(e^{10})$

i = measured current scaled into unit value

SCALING is accuracy scaling whose value depends on the required accuracy.

PUCOMP is per-unit compensation.

19. (New) A method as claimed in any one of claims claim 18, comprising:

storing a look-up table including values of function ln(a) for a set of values of parameter a, and

retrieving a value corresponding to parameter a from the look-up table during the calculation.

20. (New) A method as claimed in claim 7, wherein C being trip-class factor $t_6$ multiplied by a constant, preferably 29.5, or calculated by the formula (1/k) * Te * $(Ia/In)^2$, wherein Ia = starting current, In = nominal current, Te = allowed starting time and k = constant, preferably k = 1.22.